

nberger Fellow No. 7

..., a mechanical engineer at the Florida Institute of Technology, is primarily interested in the future of the space program. After receiving his B.S. in September, he will enter Stanford University to continue his studies in spacecraft guidance/control and space systems engineering. His internship with Astronautics Command Space Center has given him experience. He worked on payloads, fluids and testing and checking hardware and ground. One assignment involved a model survey of the thermal environment of the entire Space Shuttle. Kevin has chaired in addition to being an active member of Tau Beta Pi's Florida Chapter. He worked as an engineer for one year per week.

Paula C. Alex Fellow No. 415

Paula C. Alex, the top student in her chemical engineering class at Tuft's University, has already begun her graduate research



at the university's Biotechnology Engineering Center. Her master's project was formed in collaboration with researchers at nearby Integrated Genetics, a biotechnology firm in Framingham where she worked last summer.

Her project focuses on understanding the physical and biological variables which control growth, nutrient use, and product formation in a perfusion bioreactor system — research which will lead to a quantitative mechanistic model for the production of human therapeutics. In addition to working part time during the school year as a grader and lab assistant, Paula has participated in student organizations such as Tau Beta Pi's Massachusetts Delta Chapter, where she was cataloguer, and the AIChE, which she represented at its national convention in 1988. She also played intramural soccer.

Anthony X. Dao Fellow No. 416

Anthony X. Dao, the top engineering student at Wichita State University, will graduate with a degree in aeronautical engineering in December.



He has a special interest in lightweight composite materials used in aircraft and has had experience as a co-op student at NASA's Johnson Space Center. There he conducted a series of

tests to determine the mechanical properties of composite tubes designed for use in the Space Station building. As a university lab assistant, he conducted further research in composite materials. In graduate school at Wichita State, Tony hopes to study aerospace engineering and to explore the causes of damages to composites in order to determine parameters for their safe use and efficient design. A state and university scholar, Tony was elected to Tau Beta Pi's Mortar Board, IIME, AIAA, and SGT. He served as vice president of Tau Beta Pi's Kansas Beta Chapter, treasurer of the student chapter of the Society of Automotive Engineers, and was active in the AIAA and the Vietnamese Student Association.

Summer 1989

Thanh Dao Fellow No. 417

Thanh (Teresa) Dao, whose brother Tony is also a Fellow this year, was the top engineering student to graduate from Kansas State University in May.

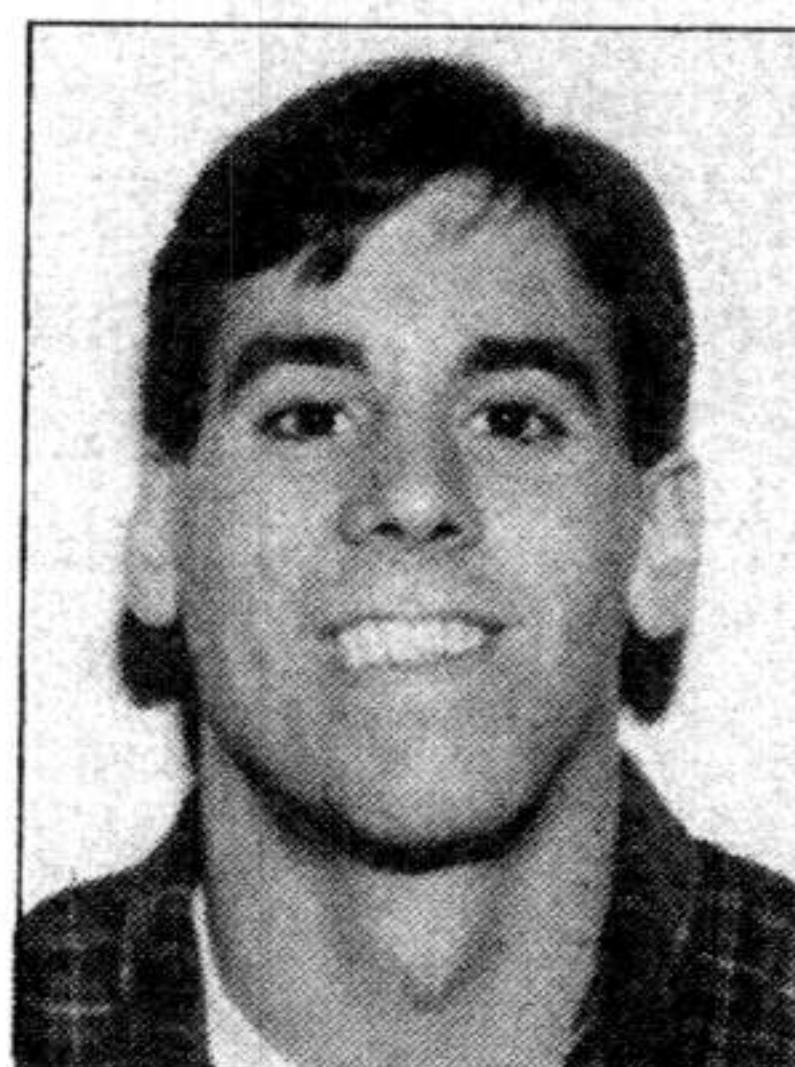


A chemical engineering major, she plans to attend the University of California, Berkeley, to begin work toward an advanced degree in polymeric materials. Her desire to contribute to R&D

efforts in the chemical industry began with her summer assignment in polymer research at AT&T's consumer products laboratory. There, her work involved characterizing polymers according to their average molecular weight, tensile strength, and rheometric properties. In the university lab, her work entailed building a database of conductive polymeric adhesives through literature searches and commercial contacts. Active in student organizations, Teresa has served as treasurer of the AIChE, SWE, OXE, and the Vietnamese Student Association. She has chaired the Engineering Ambassador Executives and the Steel Ring and was elected to Phi Kappa Phi, Alpha Xi Sigma, and Alpha Xi Sigma.

Kevin D. Diamant Fellow No. 418

Kevin D. Diamant, a mechanical engineering graduate of Cornell University, plans to continue his studies in aerospace engineering at Princeton University in the fall,



aided by a Hertz Foundation fellowship. He hopes to contribute to the advancement of space exploration by assisting in the development of more efficient and powerful

methods of propulsion for space vehicles. Focusing on chemical rockets, he plans to investigate combustion processes, rocket-nozzle design, and alternative energy sources. He has had background experience as a co-op for General Dynamics Space Systems in San Diego, CA, where he worked with a mechanical properties group and with a thermal-control group associated with the Atlas-Centaur commercial launch program. On campus, Kevin has been a participant in the tutoring service provided by Tau Beta Pi's New York Delta Chapter. He has served as a "Blue Light Escort," accompanying students across campus at night and was involved in several sports.

Robert C. Elliot Fellow No. 419

Robert C. Elliot is working toward his master's degree in hydraulic engineering at Washington State University where he

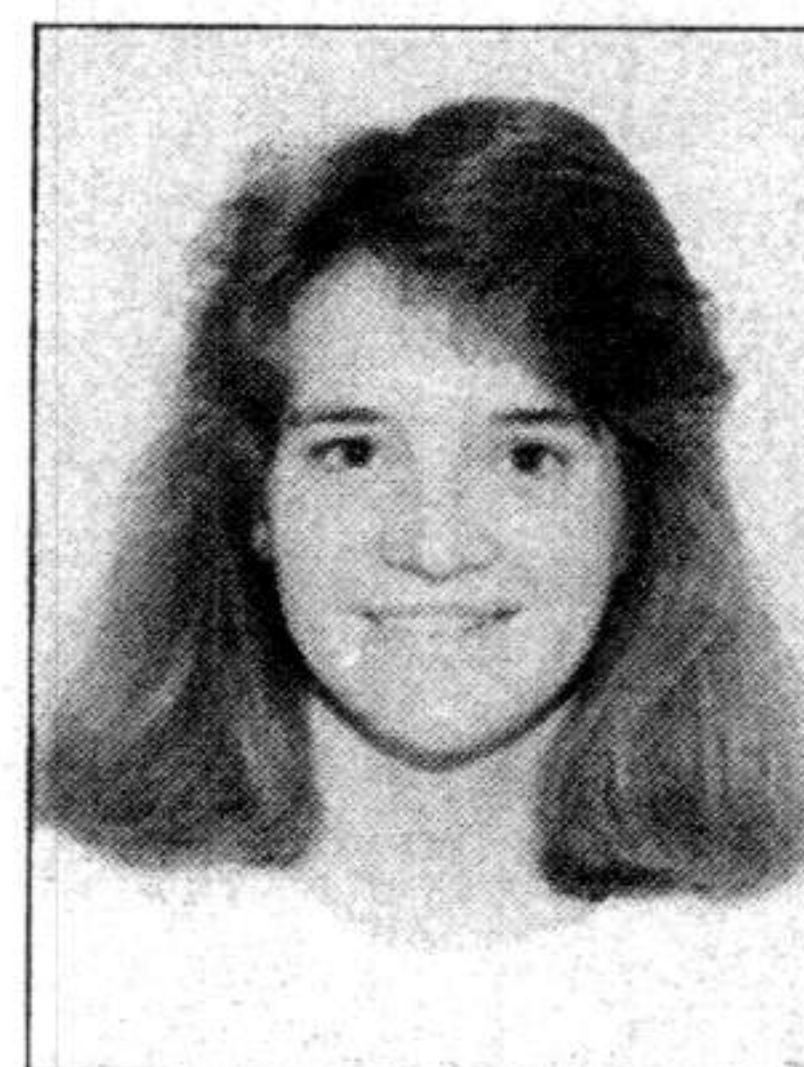


completed a B.S. in civil engineering last December. Concerned about flood damage and losses caused by dam failures, he is trying to develop numerical procedures that will describe two-dimensional dam break

flows; most flows have been described using one-dimensional mathematical models and have assumed hydrostatic pressure distribution. This past semester he has been gathering experimental data after redesigning an existing physical model. Bob was his department's outstanding sophomore, junior, and senior and was the most outstanding junior in the entire college. He participated in the university's honors program, and was elected to ODK, Phi Kappa Phi, and Mortar Board. He has served as treasurer of Tau Beta Pi's Washington Beta Chapter and has been an active member of the ASCE chapter. Bob, an Eagle Scout, is an assistant scoutmaster for the Boy Scouts of America.

Annette M. Flaim Fellow No. 420

Annette M. Flaim graduated at the top of her engineering class at the University of Wyoming where she will continue her



studies in mechanical engineering under an NSF fellowship. Interested in solid mechanics, she would like to work on a large-scale thesis project involving the mechanics of composite materials.

For two years she has worked part time in the university's laboratory conducting material tests. The last two summers, she was an intern at IBM's copier and printer division and at a small manufacturing firm, both in Colorado. Honored in several design competitions, she was a first-place winner in the regional ASME Old Guard contest for her technical oral presentation. Annette has served as vice chair and chair of the ASME student chapter and corresponding secretary of Tau Beta Pi's Wyoming Alpha Chapter. She has been a reader in her church, a resident assistant in the housing department, and a volunteer for the university's alumni association. She has studied piano and served as a geodetic aide.

kept me very busy. My first assignment (e.g. lifestyle, etc.) was a major project in the first six months of my stay. I was part of a team's research group, which focused on microelectronics, semiconductors, and crystals, and polymer materials. I worked on chemical engineering projects, and I witnessed the first-ever major earthquake in the area, but the five-day quake in town Oakland, the endless aftershocks, and the rain!

I moved to studying for a Ph.D. in the Department of Engineering, consisting of three departments: Mechanical, Electrical, and Chemical. I proved educationally successful. Since then, I have been working on a project to develop a wide wet etching process for microelectronics (research project).

I plan to return to this summer to get a Ph.D. in the fall, and to continue my engineering. In the future, I plan to work in the industrial chemical engineering field; however, I am open to other options.

My first semester in graduate school at Wichita State University was a worthwhile and enjoyable experience. My primary research deals with the problem of delamination buckling in composite material. My interest in the problem of delamination buckling stemmed from my work at NASA's Johnson Space Center, where I was involved with several projects dealing with composite truss tubes for use in the building of the space station Freedom.

Delamination, the separation of a ply from its neighboring plies, is the most common form of damage of composite material. Fracture mechanics, a science well established for conventional steel and aluminum, is employed to study the problem of delamination. Using this approach, the delamination front can be approximated as a crack in the bonding. As a composite structure undergoes buckling load, there appears a high state of stress at the crack tip that leads to the spreading of the delamination. Delamination adversely affects the stiffness of the material and thus can lead to structural instability. An understanding of the mechanics of crack propagation in composite material will provide useful insights into the problem of delamination.

In addition to the research mentioned above, my course work includes advanced engineering mathematics, advanced linear algebra, and analysis of composite material. The class work is well related to laboratory work, providing a balanced education.



**Anthony X.
Dao**

My first year as a graduate student has been quite an experience! It took a little time to adjust to the work habits of a graduate student, not to mention to the lifestyle at Berkeley. I spent most of the first semester taking classes in the fundamentals of chemical engineering. By the second semester, I began my research in the area of silylation of photoresists. Silylation is a means of incorporating silicon into photoresists. Studies of this process are parts of the effort to improve photoresist development — increasing the resolution and simplifying the procedure. I am working on deducing the mechanism and kinetics of the silylation reaction. This project is especially interesting to me in that I am applying the familiar chemical engineering principles to microelectronic fabrication technology, an area entirely new to me. All in all, it has been a great year for learning.

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I've joined a group at Princeton University doing research on magnetoplasmadynamic (MPD) rocket engines. These engines use electromagnetic body forces to accelerate an ionized propellant gas and are low-thrust, high-specific-impulse devices. The group has done a lot of work concerning the processes which limit the lifetime and efficiency of the thrusters, and is now stressing the importance of developing an understanding of the plasma physics involved in their operation.

A potential project for me is to examine the exhaust plume of a thruster and map detailed profiles of exhaust velocity and electron and ion density and temperature. That information could be useful in determining how the plume might interact with spacecraft hardware or the plume of a nearby thruster. An understanding of those interactions will be another step toward making the MPD thruster a viable space propulsion system.

Having been enrolled in "grad" school for a semester and a summer before the commencement of this Fellowship, I was already broken in to the rigors and responsibilities of research and coursework. I received my B.S. degree in civil engineering at Washington State University in December 1988, and continued my graduate studies there in the area of hydraulic engineering. With an interest in numerical modeling of open-channel flows, my classes included steady and unsteady open channel flows and computational fluid dynamics.

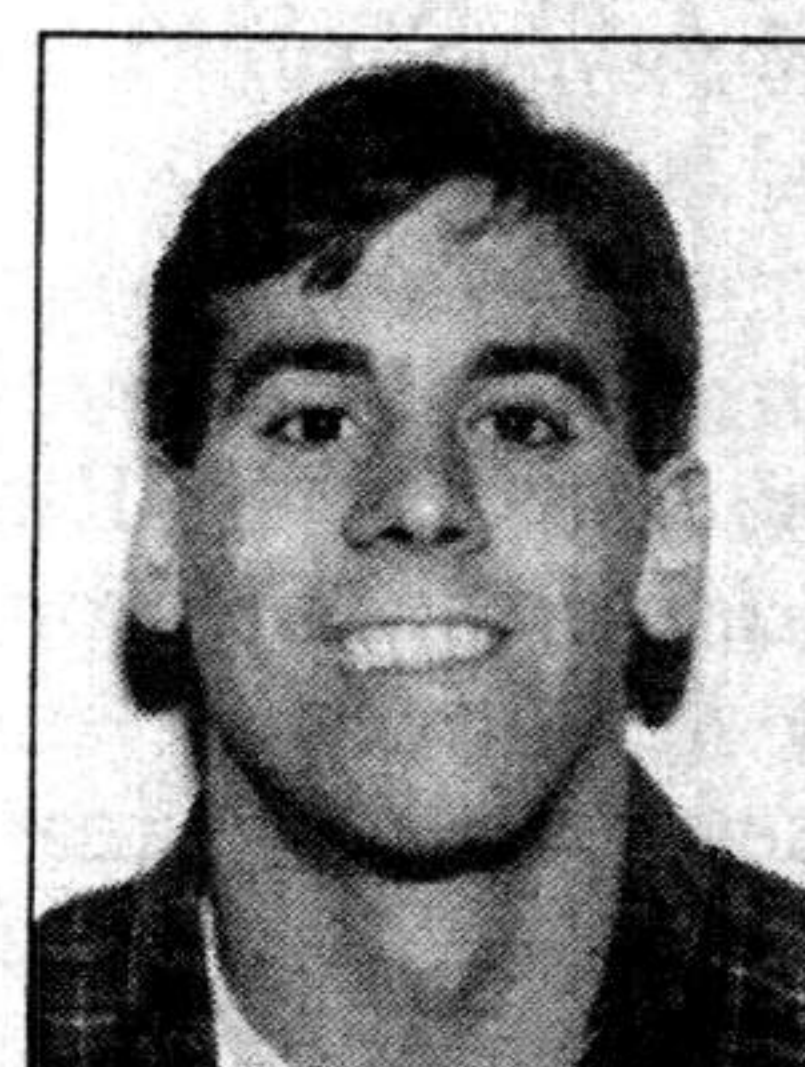
My research involved the modeling of floods resulting from the failure of a dam. I and another graduate student gathered and correlated a large set of experimental data, which included the two-dimensional effects incurred as dam-break waves traverse curved channels. Such data will be useful for numerical modelers needing data to verify or calibrate their dam-break models.

I also developed numerical procedures for predicting dam-break flood waves. This involved extending traditional one-dimensional wave propagation procedures to a two-dimensional model. The results compared favorably with the experimental data.

Having graduated with my M.S. in December 1989 (after an intense Thanksgiving "vacation" to complete my thesis), I am enjoying life in the real world. I am employed with Northwest Hydraulic Consultants Inc. in Seattle, where I am learning river engineering techniques and various commercial numerical flow models. I thank Tau Beta Pi for the financial support to allow me to complete my studies and hope to repay the Association through my contributions within the engineering profession.



**Thanh Teresa
Dao**



**Kevin D.
Diamant**



**Robert C.
Elliot**

During the past year I have been working toward a master's degree in mechanical engineering at the University of Wyoming. I enjoy graduate school because I have fewer classes than I did as an undergraduate, and the subject matter is more specific. I believe my graduate education was worth the time and effort because I gained specialized knowledge and experience in my interest area of solid mechanics. I also used the computer for analysis much more than I did in my undergraduate studies.

My NSF fellowship allowed me to give up my part-time jobs and concentrate on schoolwork, as well as remain active in our student chapters of ASME and Tau Beta Pi. Being chosen as a Tau Beta Pi Fellow was definitely a highlight of my graduate career. After completing my coursework this spring, I will concentrate on completing my thesis project, which involves examining rate-dependent fracture under biaxial loading. I'm getting married this summer, and I hope to finish my master's degree in the fall. After completing my degree, I will probably go to work for Woodward Governor Company in Fort Collins, CO, as a mechanical engineer.